NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR

Conserve O Gram

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How To Preserve Acidic Wood Pulp Paper

Background

Early American papermakers used cotton and linen rags with relatively few additives to produce small quantities of strong and durable papers. Animal glue and gelatin sizing or coatings were added to help these long-fibered papers accept ink without bleeding.

This early American hand-made paper has long cellulose fibers and little grain, making it unusually strong. The sheet may have a feathered or deckled edge and/or a watermark.

Increased demand for paper led to the development of more efficient manufacturing processes. In 1806 a new sizing process was developed using alum to precipitate rosin on the paper fibers. Alum is acidic and removes calcium carbonate left from the washing process. The result was decreased permanence of the paper. The use of mechanical papermaking equipment during the Industrial Revolution led to less durable shorter fibered papers with a pronounced grain.

Along with alum/rosin, the addition of chlorine bleach led to further weakening of paper fibers and more paper acidity, discoloration, and brittleness. Each of these elements helped cause declines in the life expectancies of American paper.

The biggest single factor in paper deterioration may have been the change from rag and linen to ground wood pulp. Compared to rags, wood was widely available and inexpensive, making it an irresistible source of fibers for manufacturing paper.

Types of Wood Pulp Paper

- **Groundwood Pulp Paper.** Also known as mechanical wood pulp, it was first developed in the early 1800s and is used today for newsprint and pulp novels. Wood is mechanically ground to produce fibers for paper pulp. Grinding creates very short paper fibers, which are also highly acidic due to the retention of the wood's lignin.

  Lignin is a naturally occurring substance in wood that darkens and breaks down into acidic byproducts as it ages. Ground wood pulp paper is born acidic and rapidly becomes brittle. Therefore ground wood pulp paper has a relatively short life expectancy.

- **Chemical Wood Pulp Paper.** Also called soda, sulfite, sulfate or Kraft paper (depending upon how it is processed), chemical wood pulp paper was first developed in the mid-1800s. Chemical wood pulp paper is used today in printer and notebook papers, as well as in Kraft and Manila papers and boards.

  To make chemical wood pulp paper, wood chips are cooked in acidic or caustic chemicals that dissolve out the lignin, thus separating the fibers. Chemical wood pulp paper fibers tend to be longer and stronger since they weren't finely ground down as mechanical wood pulp papers are.

Chemical wood pulp papers tend to be slightly stronger than ground wood pulp papers and to have a greater life expectancy.

During processing, chemical wood pulp is bleached to whiten the naturally brown paper. The paper may also be sized or coated with acidic chemicals for various surface finishes. **These bleaching and sizing agents tend to make the chemical wood pulp papers acidic.**

Most American archival, library, and museum collections contain clippings, correspondence, journals, and reports on wood pulp paper. This paper may darken or stain nearby materials because of its acidity. Wood pulp paper requires careful management during storage, handling, and use.

Problems of Wood Pulp Papers

Wood pulp papers have three problems:

- **relatively short paper fibers,** which can cause inherent weakness in wood pulp paper. This is particularly true for ground wood pulp paper.

- **high lignin content in ground wood pulp paper,** which can cause paper acidity, darkening, staining of nearby materials, and deterioration

- **high acidity,** which can lead to brittleness and discoloration of the paper. Some chemical wood pulp paper is sized with alkaline chemicals to help solve this problem.

Reformatting as an Effective Alternative to Conservation Treatment

The least expensive way to retain information on deteriorated or poor quality wood pulp paper is to reformat it. Most frequently archives, libraries, and museums do one of the following:

- microfilm materials
- microfilm and digitize materials
- photocopy information onto archival quality paper.

NOTE: Digital reformatting alone is not a preservation solution due to the prohibitive cost of maintaining playback software/hardware and migrating data over time.

Reformatting must be done to archival standards including visual inspection and quality control (QC) testing. Without careful inspection and QC, copies may have a shorter lifetime and be less usable than the original. See *Conserve O Grams* 19/10 and 19/11 for guidance (on the Web at: <www.cr.nps.gov/museum/publication.index.htm>).

When to Rehouse Documents

Whether or not you reformat your wood pulp paper documents to make them more accessible, you should preserve the originals by rehousing them in high quality materials.

One good rehousing choice that works for both newsprint and other wood pulp papers is to place the paper in an inert polyester film (such as Mylar® Type D) folder or an L-welded envelope (the welds are on the left side and bottom) with a sheet of neutral or alkaline pH high alpha cellulose lignin free paper behind the document and within the folder.

When housed as described, the polyester film supports the wood pulp paper and at the same time allows the paper to be handled and read without human contact with the actual document. The archival paper helps absorb acids from the wood pulp paper. Before rehousing, remove all fasteners.

NOTE: Polyester film is generally used with oversized fragile newspapers or those that will be used or handled frequently.

Never use polyester film cover sheets directly against media that is friable or loose. Friable media, such as charcoal, pencil, conté crayon, or pastel, should instead be housed in window or sink mats, or paper folders. See *Conserve O Gram* 13/1, Window Mats for Paper Objects.
To house fragile oversize newspaper clippings, many organizations use a backing sheet of high alpha cellulose, lignin-free neutral or alkaline pH

mat board or heavy weight paper. A cover sheet of either a neutral or alkaline pH paper or a polyester film is placed over the item before it is placed in a neutral or alkaline pH folder. The backing sheet helps absorb the document's acidity and at the same time provides support and protection if the document is brittle or fragile. These collections should be placed on a 10-year maintenance cycle. At that time, check the backing paper with a pH testing pen. If the test indicates the backing paper is no longer acceptable, it should be replaced.

NOTE: Never use a pH testing pen on a document.

Following rehousing, place the foldered document in its original location in a flat print box or on its side in a document box. If the original location is inappropriate, place a separation sheet there indicating the new location of the item. Never house fragile items in either:

- **very tightly filled boxes,** as items may be damaged during removal
- **under filled boxes,** as the items may slump within their folders, causing distortion

In either case, replace the item with a separation sheet and place it in a flat print box.

How to Store and Use Wood Pulp Paper

- Store wood pulp papers in dark storage at a low and constant temperature (below 0°) and relative humidity (below 40%). Low temperature, relative humidity, and light will extend the life expectancy of the documents.

Store documents far from any sources of volatile acids or pollution, including new furniture and photocopy machines.

- Avoid handling original wood pulp paper documents by providing copies for reference.
- Don't place buffered paper next to colored inks, dyes, or papers. See Conserve O Gram 4/9.
- Produce duplication master copies to be used when making future photocopies, rather than continuously copying from the original documents.
- Wear tight fitting gloves while handling documents.
- Lift documents using a high quality support board.
- Avoid leaning on documents or pressing on their surface in any way.
- Avoid exhibiting wood pulp paper documents. Even relatively low light levels can cause some documents to darken.
- Avoid the use of poor quality plastic enclosures or housing, as the plasticizers may cause the media in the documents to transfer to the housing.
- Avoid all attempts to repair damaged documents with pressure sensitive tape.

When to Consider Treatment

Give special attention to significant original documents on wood pulp paper that must be kept and routinely made accessible due to their value. You may also wish to consider treatment of these documents if they are ripped, torn, or highly acidic and brittle.

Treatment is generally NOT done for copies, newsprint, or duplicates due to the cost. Instead, preserve copies, newsprint, and duplicates via reformatting and preservation rehousing.

Are Deacidification Sprays a Good Idea?

No. Preventing acidity in paper is best done when you create a document (by selecting high alpha cellulose, neutral or alkaline pH paper), not by

treatment of the poor quality paper document later. Prevention is always preferable to treatment.

If researchers must use acidic and brittle wood pulp paper documents, begin your preservation work by reformatting and rehousing the documents as described above. If more needs to be done, see a conservator, who can analyze treatment options and discuss them with you.

Deacidification sprays neither solve brittleness in wood pulp paper, as they don't lengthen paper fibers, remove lignin, or permanently remove acidity, nor do they make paper less discolored.

The buffering in the deacidification sprays depletes naturally over time, loosing effectiveness. The sprays must be reapplied when the paper's natural acidity reasserts itself.

Deacidification Spray Problems

Deacidification sprays can cause some problems. They can:

- **darken newsprint** and some other wood pulp papers
- **change the colors of color media and supports**, such as dyes, inks, and papers
- **cause staining** on some types of papers and leathers
- **lead to a residue build-up** on paper
- **lead to cockling and buckling** of some papers
- **cause running of some media,** such as inks, pigments, and watercolors

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Diane Vogt-O'Connor
Senior Archivist
Museum Management Program, NPS

Dianne van der Reyden
Senior Paper Conservator
Smithsonian Center for Materials Research and Education

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